Claims

1. Method for producing a lithium microbattery successively comprising formation of first and second current collectors (2a, 2b), of a cathode (3), of an electrolyte (5) comprising a lithiated compound and of an anode (8) comprising lithium on a substrate (1), characterized in that the formation step of the electrolyte (5) comprises at least the following successive operations:
   - deposition of an electrolytic thin layer (5a) on the substrate (1) provided with the current collectors (2a, 2b) and with the cathode (3),
   - deposition, on the electrolytic thin layer (5a), of a first protective thin layer (6a) that is chemically inert with regard to lithium, and then of a first masking thin layer (7a),
   - fabrication of a mask (4d) by photolithography on the first masking thin layer (7a),
   - selective etching of the first masking thin layer (7a) then removal of the mask (4d),
   - selective etching of the first protective thin layer (6a) and of the electrolytic thin layer (5a) so as to form the electrolyte (5) in the electrolytic thin layer (5a), and removal of the first protective thin layer (6a) and of the first masking thin layer (7a).

2. Method according to claim 1, characterized in that the first protective thin layer (6a) consists of a first material chosen from a hydrogenated amorphous silicon carbide, a hydrogenated amorphous silicon oxycarbide, a hydrogenated amorphous silicon carbonitride, hydrogenated amorphous carbon, fluorinated and hydrogenated amorphous carbon, a fluorinated and hydrogenated amorphous carbon nitride.

3. Method according to claim 2, characterized in that the first masking thin layer (7a) consists of a second material distinct from the first material and chosen from a hydrogenated amorphous silicon carbide, a hydrogenated amorphous silicon oxycarbide, a hydrogenated amorphous silicon carbonitride, a silicon nitride and a silicon oxide.

4. Method according to any one of the claims 1 to 3, characterized in that once the electrolyte (5a) has been formed, a second protective thin layer (6b) is deposited on the whole of the substrate (1) comprising the current collectors (2a, 2b), the cathode (3) and the electrolyte (5).

5. Method according to claim 4, characterized in that the second protective thin layer (6b) consists of the same material as the first protective thin layer (6a).

6. Method according to any one of the claims 1 to 5, characterized in that formation of the anode (8) comprises at least the following steps:
   - deposition of an anodic thin layer (8a) on the substrate (1a) provided with the current collectors (2a, 2b), the cathode (3) and the electrolyte (5),
   - deposition of a third protective thin layer (6c) and then of a second masking thin layer (7b) on the anodic thin layer (5a),
   - fabrication of a mask (4e) by photolithography on the second masking thin layer (7b),
   - selective etching of the second masking thin layer (7b) then removal of the mask (4e),
   - selective etching of the third protective thin layer (6c) and of the anodic thin layer (8a) so as to form the anode (8) in the anodic thin layer (8a) and removal of the protective thin layer (6c) and masking thin layer (7b).

7. Method according to claim 6, characterized in that the third protective thin layer (6c) consists of the same material as the first protective thin layer (6a)

whereas the second masking thin layer (7b) consists of the same material as the first masking thin layer (7a).

8. Method according to any one of the claims 1 to 7, characterized in that once the anode (8) has been formed, it consists in depositing a fourth protective layer (6d) on the stack formed by the current collectors (2a, 2b), the cathode (3), the electrolyte (5) and the anode (8).

9. Method according to claim 8, characterized in that the fourth protective thin layer (6d) consists of the same material as the first protective thin layer (6a).

10. Method according to any one of the claims 1 to 7, characterized in that once the anode (8) has been formed, it consists in depositing, on the stack formed by the current collectors (2a, 2b), the cathode (3), the electrolyte (5) and the anode (8), a protective envelope (9) covering the whole of the stack to protect the latter against any external contamination.

11. Method according to claim 10, characterized in that the protective envelope (9) comprising at least first and second distinct superposed encapsulation layers (9a, 9b), the first encapsulation layer (9a) comprises at least one material that is chemically inert with regard to lithium, chosen from a hydrogenated amorphous silicon carbide, a hydrogenated amorphous silicon oxycarbide, hydrogenated amorphous carbon, fluorinated amorphous carbon and hydrogenated amorphous silicon whereas the second encapsulation layer (9b) comprises a material chosen from a hydrogenated amorphous silicon carbonitride, a hydrogenated amorphous silicon nitride and fluorinated amorphous carbon, the first and second encapsulation layers (9a, 9b) being successively deposited on the whole of the anode (8) by plasma enhanced chemical vapor deposition at a deposition temperature less than or equal to 150°C.

12. Method according to claim 11, characterized in that it consists, before deposition of the second encapsulation layer (9b), in depositing an intermediate layer (9c) comprising a material chosen from a phosphorus-doped silicon oxide, hydrogenated amorphous carbon and fluorinated amorphous carbon by plasma enhanced chemical vapor deposition at a deposition temperature less than or equal to 150°C.